# COSC 6377 - Fall 2023
HW1

1 - Suppose you are hired as a network manager at the university. The university is planning on enforcing a policy to prevent all users (faculty, students, staff, guests) from accessing website tiktok.com while using the campus network. Propose two solutions to implement this policy in the campus network. Provide sufficient explanation on how each solution prevents users from accessing the website.

2 - Consider the network below. The server contains a file with the size of 30 Gigabits. Users U1, U2, and U3 are trying to download this file from the server. The Upload Speed (US) and the Download Speed (DS) of each link is also shown in this figure. U1 starts downloading at time t=0s, U2 starts at t=10s, and U3 starts at t=20s.
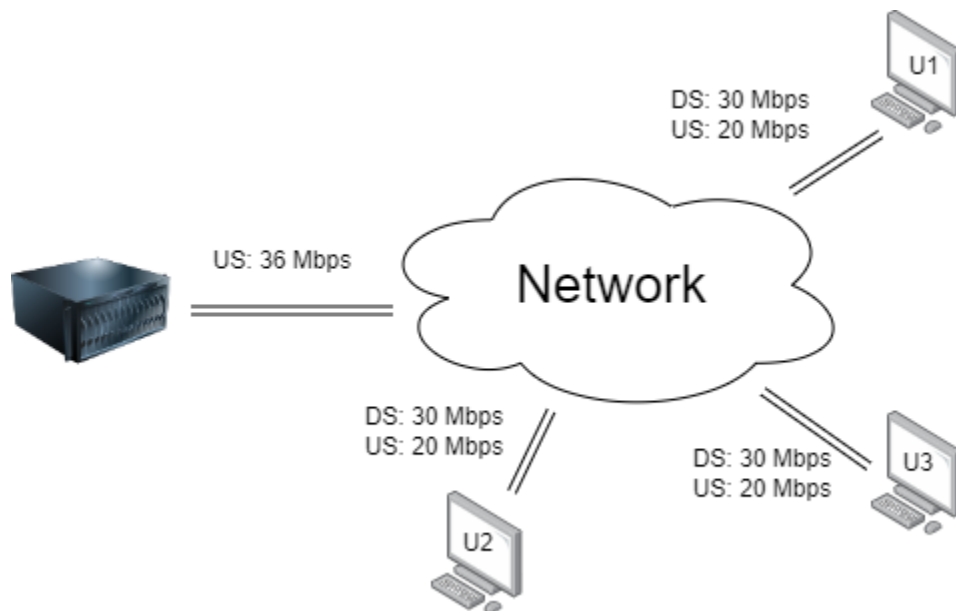
(a) If the users and the server use the client/server architecture, what will be download time for each user. You can assume that the server divides the bandwidth equally among all the users that are connected to the server.

(b) To reduce download time, users agree to implement a peer-to-peer protocol where each user shares the segments of the file it has with other users and users only access the server for the remaining segments that are still unavailable. If U1, U2, U3 start downloading at 0s, 10s, 20s using this peer-to-peer protocol, how much improvement will they get compared to the client/server approach.

3 - To increase security, the University of Houston is planning on restricting the access of the guest users. In this policy, guest users are only allowed to use the campus network to access the Internet and some of the public University websites. They are also not allowed to access the content of the packets sent from faculties or students.

The UH IT department asks you to propose a solution to implement this policy. In the current network infrastructure, all network users and servers are connected to the same network and the university is reluctant to change the current physical topology. However, you are free to make any software change. What is going to be your proposed solution for this problem?

4 - Node A wants to send a 10 GB file to node B. The round trip time between the nodes is 200 milliseconds and the data rate of the link between the nodes is 100 Mbps. Suppose that the maximum frame size is 1020 bytes and packet header size is 20 bytes. The transmission time (not the propagation time) of the ACK frame is negligible.
   (a) Without any ack messages to ensure reliability, how long does it take for A to send the file to B.
   (b) If both nodes decide to use stop-and-wait protocol with window size of one, what will be the new file transfer time?
   (c) If nodes decide to increase window size to 100, what will be the new transmission time?
   (d) What is the best window size that minimizes the file transfer time?

5 - We are developing an implementation of a TCP protocol and we are using EWMA to estimate TCP RTT. However, in our code there is a bug that reduces the sample RTT by 20%. The table below describes the RTTs measured during a TCP trace:

Step	Measured RTT
1	20 ms
2	30 ms
3	25 ms
4	22 ms

   (a) Considering the bug in the implementation, what is the estimated RTT at step 5.
   (b) What is the impact of this bug on the performance of TCP?